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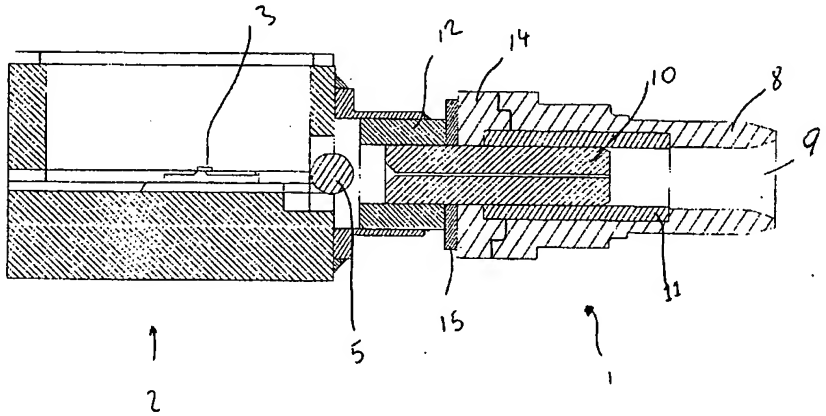
(54) Opto-electronic module with insulated connector

(57) This invention relates to an optical sub assembly for receiving an optical fibre transmission line for coupling to an optical device, to a receptacle for use in such a sub assembly and to a method of manufacture of such a sub assembly. In particular, this invention relates to an optical sub assembly which provides electrical isolation between a receptacle (1) having a nose (8) for receiving the optical fibre and a package (2) housing an optical device (3).

The nose (8) houses a ferrule (10) containing a fibre stub (13) which may be optically aligned with an optical device (3) housed in a package (2) before securing the receptacle (1) to the package (2). In this invention electrical insulation is provided between the nose (8) and the package (2) by means of a sleeve (12) extending along a middle portion of the ferrule (10) and an insulating portion (15) positioned between the sleeve (12) and the nose (8).

Fig. 2



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Description

[0001] This invention relates to an optical sub assembly for receiving an optical fibre transmission line for coupling to an optical device and to a receptacle for use in such a sub assembly. In particular, this invention relates to an optical sub assembly for coupling via a receptacle which is able to provide electrical isolation between the receptacle for receiving the optical fibre and a package housing the optical device. The invention also extends to a method of manufacturing such an optical sub assembly.

[0002] Typically a transmitter or receiver component are mounted in a metal panel. A receptacle which may extend outwardly through an aperture in the panel is provided for receiving an optical fibre, and a package extending behind the panel houses the transmitter or the receiver. In known optical sub assemblies the receptacle houses a ceramic ferrule containing an optical fibre stub and a package has an aperture for receiving the ceramic ferrule. The receptacle and the package may be aligned to obtain an optimum coupling efficiency between the fibre stub and the optical device. The receptacle is secured to the package by soldering, welding or brazing. In order to maintain dimensional stability the receptacle and the package are formed from a stable material such as stainless steel.

[0003] In order to prevent electromagnetic emissions, the panel is earthed (grounded) through the mains, which results in the package housing the optical device being earthed through the mains. However, the transmitter and receiver operate at very high frequencies (GHz) and they are supplied with electrical power at low voltages from stabilised power supplies. These power supplies are generally earthed independently of the casing, which means that the earth on the housing of the optical devices is not the same earth as the earth on the electronic circuit boards upon which the optical devices are mounted.

[0004] High frequency operation results in a radio frequency emission problem. One way in which the emission problem could be reduced would be to provide the same earth for the power supply and the mounting panel. However this is counter to the user requirement for freedom to have a different earth for the power supply and the mounting panel, so the problem to be solved is to provide an optical sub assembly in which the receptacle and package may be electrically isolated from one another.

[0005] This problem is not as straightforward to solve as it might initially seem, due to the dimensional stability required for the receptacle. Furthermore, for a sub assembly for an optical transmitter there may be a requirement to align a ceramic ferrule housed in the receptacle with the optical transmitter housed in the package prior to securing the receptacle to the package. The securing process must maintain an optimum alignment within typically 0.1 - 1 μm (micron).

[0006] According to the present invention there is provided an optical fibre receptacle for receiving an optical fibre transmission line comprising a nose housing an end of an insulating ferrule, and having an aperture for receiving said optical fibre transmission line; characterised in that the receptacle further comprises a sleeve extending along a second portion of the ferrule; and an insulating disc positioned between the sleeve and the nose providing, along with the insulating ferrule, electrical insulation between the sleeve and the nose.

[0007] According to another aspect of the invention there is provided an optical sub assembly comprising a receptacle as described above; a package having an aperture at one end for receiving the receptacle and an optical device housed within the package.

[0008] It is an advantage if the receptacle are connected together using an electrically conducting hermetic seal which may be achieved by welding, soldering or brazing.

[0009] According to a further aspect of the invention there is also provided a method of manufacturing an optical fibre sub assembly comprising the steps of actively aligning a receptacle as described previously with an optical device positioned within a package, when an optimum coupling efficiency is achieved, securing the receptacle to the rear part.

[0010] It is an advantage, in this method, if the receptacle and the package are connected together using an electrically conducting hermetic seal which may be achieved by welding, soldering or brazing.

[0011] Embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 shows a perspective view of an optical sub assembly according to a first embodiment of the present invention;
Figure 2 illustrates a side cross section of the fibre sub assembly of figure 1;
Figure 3 shows a perspective view of an optical sub assembly according to a second embodiment of the present invention; and
Figure 4 illustrates a side cross section of the sub assembly of figure 3.

[0012] Referring firstly to figure 1, an optical sub assembly comprises a receptacle 1 for receiving an optical fibre, and a package 2 housing an optical device 3. In this case the optical device is an optical transmitter, which is coupled to an optical fibre stub in a ceramic ferrule 10 by a lens 5. The optical device 3 is mounted on a circuit board 4. Conventionally, two such sub assemblies housing an optical transmitter and an optical receiver will be mounted in a metal box, and mounted on a metal plate as a transceiver pair, possibly alongside several other transceiver pairs. RF emissions are generated by the optical components, and the package casing is electrically noisy. Hence there is a requirement to

electrically isolate the receptacle from the package.

[0013] Referring now to Figure 2, the receptacle 1 comprises a nose 8, which is generally cylindrical in shape, having an aperture 9 at one end for receiving an optical fibre. The nose has a chamfered edge at the end with the aperture. The other end of the nose houses the ceramic ferrule 10 which is arranged to hold an optical fibre stub. The ceramic ferrule 10 has a split sleeve 11 fitted around one end, which is arranged to centre and clamp the end of the ferrule 10. The nose 8 and the split sleeve 11 are fitted to a holder 14. This embodiment of the invention has a ceramic ferrule, but it will be understood that any suitable electrically insulating material may be used.

[0014] An insulating portion, in this case a ceramic washer 15 is positioned between a sleeve 12 and the holder 14. The ceramic washer 15 has the front and back faces plated with an appropriate metal in order to allow soldering or brazing of the washer to the holder 14 and to the sleeve 12.

[0015] The ceramic washer 15, together with the ceramic ferrule 10 electrically isolates the two parts of the sub assembly from each other so that the package housing the optical device can be earthed to a different earth than the receptacle of the sub assembly into which a user inserts an optical fibre transmission line.

[0016] It will be understood that the ceramic ferrule is likely to be extended compared to ferrules of prior art sub assemblies, due to the presence of the sleeve 12, and the washer 15.

[0017] In the transceiver of Figure 1 and Figure 2 there is shown an alignment collar 6 attached to the exterior of the package 2. The alignment collar 6 allows the receptacle 1, containing an optical fibre stub, to be actively aligned with the optical transmitter 3. Active alignment is the process of alignment that is carried out with the optical transmitter 3 switched on. The coupling efficiency achieved between the optical transmitter 3 and the optical fibre stub, is measured. Once a desired coupling efficiency is achieved then the receptacle 1 is considered to be optimally aligned with the optical transmitter 3. Then the receptacle is brazed, soldered or welded to the alignment collar, achieving a hermetic seal whilst allowing the receptacle to be electrically isolated from the package.

[0018] Figure 3 illustrates a second embodiment of the invention, in which the sub assembly is designed to connect an optical fibre (not shown) to an optical receiver 3'. In this example there is no coupling lens used.

[0019] Figure 4 illustrates a cross section of the sub assembly shown in Figure 3. The receptacle 1 and the package 2 are similar to those illustrated in Figure 2, although the alignment collar 12 of Figure 2 has been omitted in the embodiment shown in Figure 4.

Claims

1. An optical fibre receptacle (1) for receiving an optical fibre transmission line comprising
   a nose (8) housing an end of an insulating ferrule (10), and having an aperture (9) for receiving said optical fibre transmission line; **characterised in that** the receptacle further comprises
   a sleeve (12) extending along a second portion of the ferrule (10); and
   an insulating portion (15) positioned between the sleeve (12) and the nose (8) providing, along with the insulating ferrule (10), electrical insulation between the sleeve (12) and the nose (8).

2. An optical fibre sub assembly comprising
   a receptacle according to claim 1;
   a package (2) having an aperture at one end for receiving the receptacle (1) and
   an optical device (3) housed within the package (2).

3. A sub assembly according to claim 2, in which the package and the receptacle are connected together using an electrically conducting hermetic seal.

4. A sub assembly according to claim 3, in which the seal is provided by welding, soldering or brazing.

5. A method of manufacturing an optical sub assembly comprising the steps:

   actively aligning a receptacle according to claim 1 with an optical device positioned within a package;
   when a predetermined coupling efficiency is achieved, securing the receptacle to the rear part.

6. A method according to claim 5, in which the securing step comprises connecting the receptacle and the package to each other using an electrically conducting hermetically seal.

7. A method according to claim 6 in which the securing step comprises connecting the receptacle and the package to each other by welding, soldering or brazing.

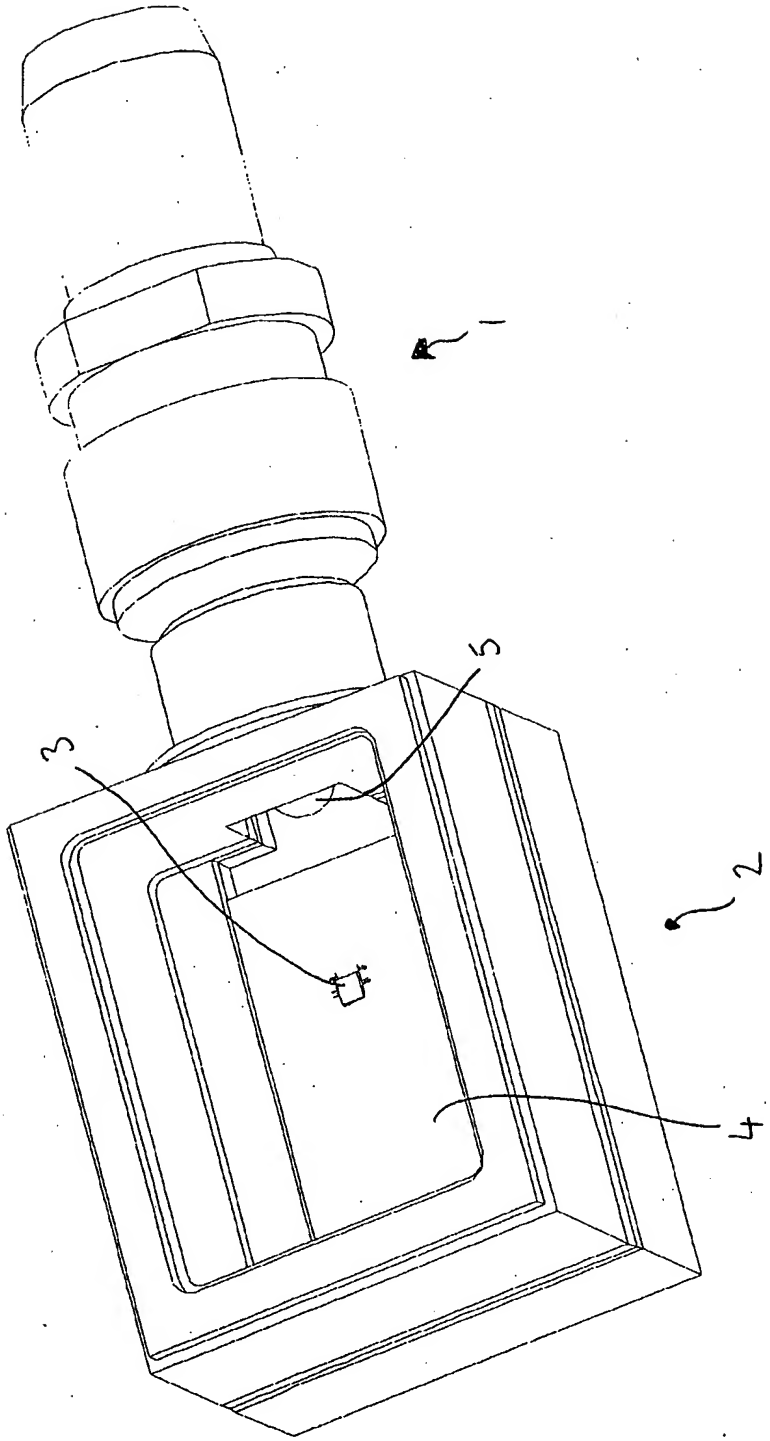

Fig. 1

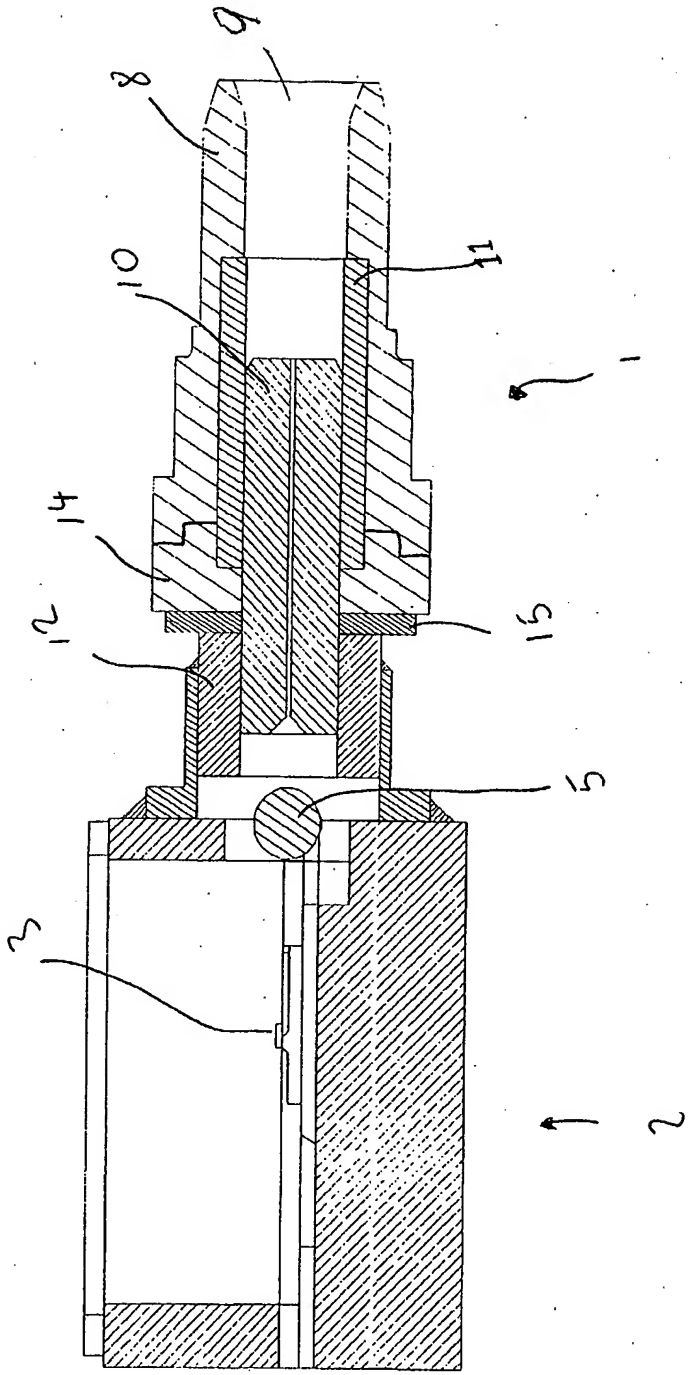

Fig. 2

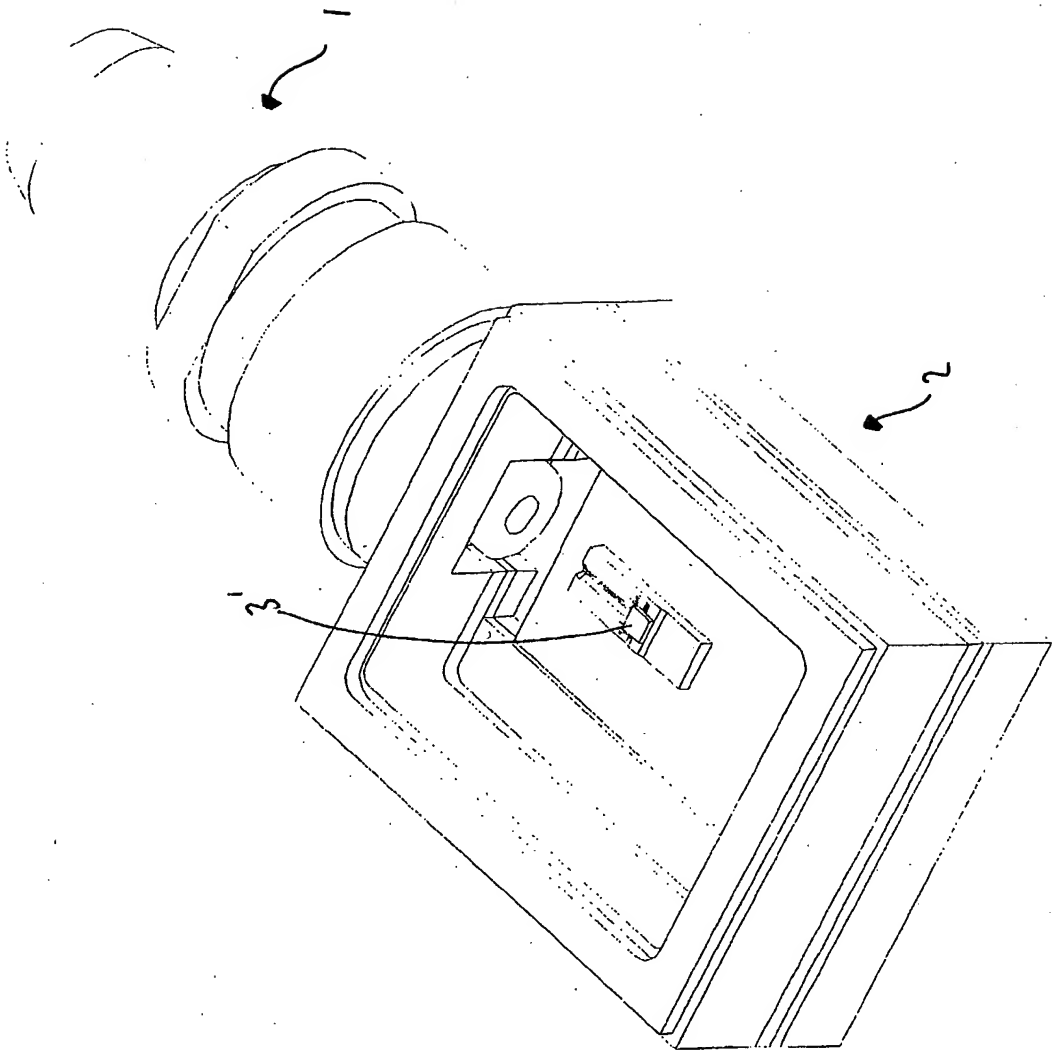

Fig. 3

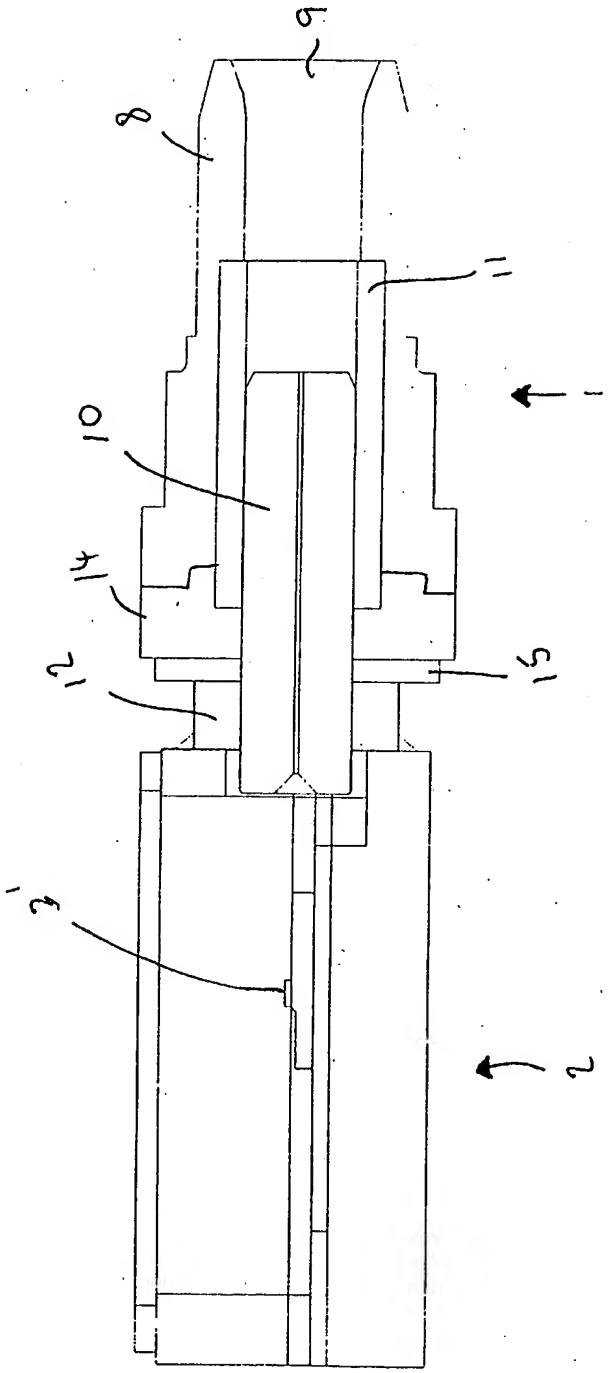

Fig 4

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EUROPEAN SEARCH REPORT

Application Number
EP 02 25 0413

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Y	US 5 085 492 A (BUZAWA DAVID M ET AL) 4 February 1992 (1992-02-04) * abstract; figures 2,3 * * column 3, line 51 - column 4, line 9 *	1-7	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	3 June 2002	Faderl, I

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EUROPEAN SEARCH REPORT

Application Number
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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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Place of search	Date of completion of the search	Examiner
THE HAGUE	3 June 2002	Faderl, I

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